

## Econometric Analysis (Spring 2011)

### Midterm Exam

Answer to all the questions.

I. (30 points)

- (1) Define precisely a consistent estimator.
- (2) State precisely the central limit theorem.
- (3) State precisely the weak law of large numbers.

II. (40 points) Consider the estimation of the following model.

$$y = \mathbf{x}\boldsymbol{\beta} + u$$

where  $\mathbf{x} = (1, x_2, \dots, x_K)$  is  $1 \times K$  vector of explanatory variables,  $\boldsymbol{\beta} = (\beta_1, \dots, \beta_K)'$  is  $K \times 1$  vector of parameters. Assume that the data are i.i.d. random sample from the population distribution with sample size  $N$ .

- (1) State the assumptions for the OLS estimator to be consistent.
- (2) Is  $\boldsymbol{\beta}$  identifiable? Explain.
- (3) Derive the OLS estimator, and prove its consistency under the assumption in (1).
- (4) Derive the asymptotic distribution of the OLS estimator.

III. (30 points) Answer the following questions.

- (1) What does “endogeneity” mean in this class?
- (2) State three main causes of endogeneity explained in the class.
- (3) Choose one cause of endogeneity in (2) and provide an example describing an endogeneity problem.
- (4) Explain a method to solve the endogeneity problem you described in (3).